

# EXHIBIT A

**Analysis of Hourly Earnings of Piece Rate Harvest Workers  
in the Northwestern United States**

Zachariah Rutledge, Ph.D.<sup>1</sup>

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**Abstract**

This analysis uses publicly available data from two sources: the National Agricultural Workers Survey spanning the federal fiscal years 2011-2020 (DOL, 2023) and the USDA Farm Labor Survey spanning the calendar years 2010 through 2019 (USDA, 2023).<sup>2</sup> First, I extract the hourly earnings of harvest workers from the National Agricultural Workers Survey who are paid piece rates and those who are paid an hourly wage and calculate the percentage of piece rate harvest workers who had hourly earnings that were higher than the applicable Adverse Effect Wage Rate. I conduct analyses for the Northwestern region of the United States, which contains the state of Washington, and for the state of California. I find that *at least* 70% of the piece rate harvest workers in the Northwestern region had hourly earnings that were higher than the Adverse Effect Wage Rate between fiscal years 2011 and 2020, and that piece rate harvest workers earned an average of 41% more per hour than harvest workers who were paid on an hourly basis over that period of time. I also find that *at least* 69% of the piece rate harvest workers in the Northwestern region had hourly earnings that were higher than the Adverse Effect Wage Rate between fiscal years 2016 and 2020, and that piece rate harvest workers earned an average of 24% more per hour than harvest workers who were paid on an hourly basis over that period of time. In California, I find that 61% of the harvest workers who were paid piece rates had hourly earnings that were above the Adverse Effect Wage Rate between fiscal years 2011 and 2020, and that piece rate harvest workers earned an average of 24% more per hour than harvest workers who were paid an hourly wage rate over that period of time. In California, I also find that 77% of the harvest workers who were paid piece rates had hourly earnings that were above the Adverse Effect Wage Rate between fiscal years 2016 and 2020, and that piece rate harvest workers earned an average of 34% more per hour than harvest workers who were paid an hourly wage rate over that period of time. The earnings premia of 24% to 41% for piece rate harvest workers relative to hourly wage harvest workers are consistent with findings in the labor economics literature (Lazear, 2000).

**Data and Methodology**

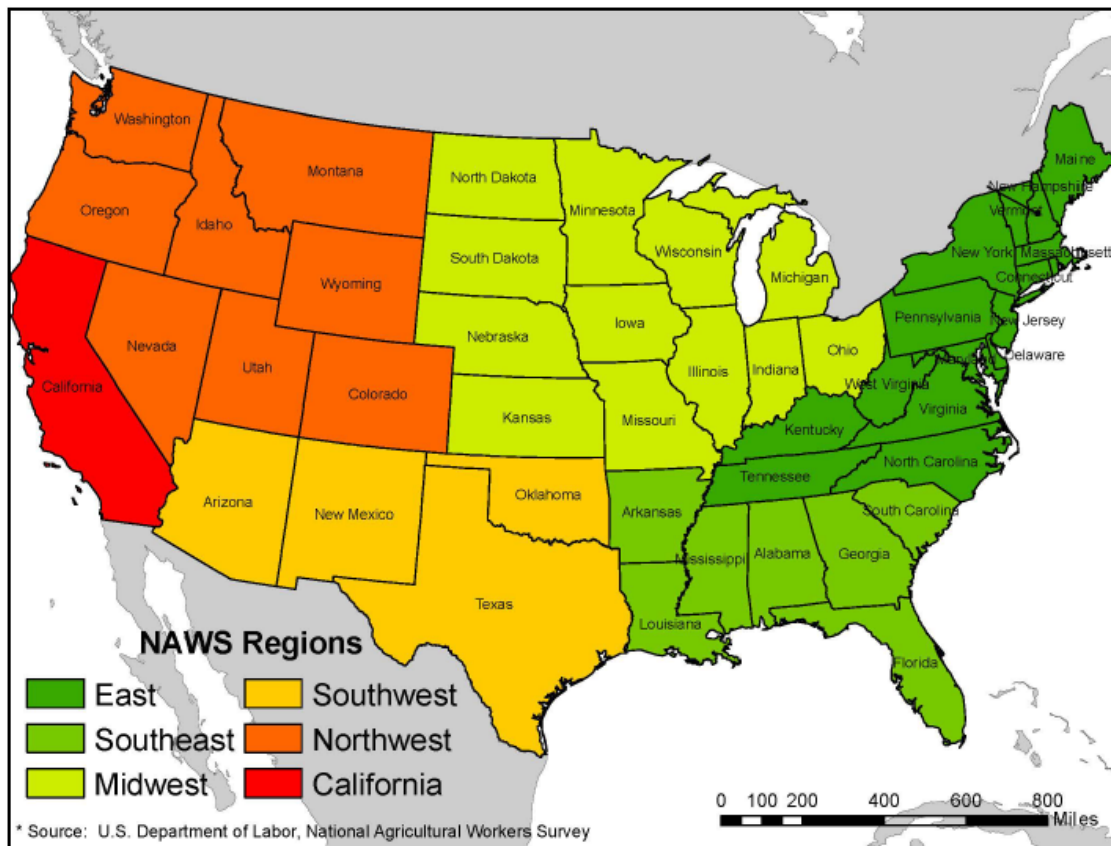
To identify the hourly earnings of piece rate harvest workers, I processed data from the public-access National Agricultural Workers Survey (NAWS) in the statistical software program Stata. The NAWS is a random sample of US crop workers that collects highly detailed information from employees in face-to-face interviews at their place of work. The public-access NAWS data allows researchers to calculate regionally representative statistics for five multi-state regions and for the

<sup>1</sup> Dr. Rutledge is acting in his own individual capacity and not on behalf of Michigan State University. Michigan State University does not endorse, sponsor, or support this work.

<sup>2</sup> Note that the Farm Labor Survey data for calendar years 2010 – 2019 are the Adverse Effect Wage Rates for the 10 year period spanning calendar years 2011 - 2020.

state of California (see Figure 1).<sup>3</sup>

**Figure 1:** Public Access National Agricultural Workers Survey Region Map



Source: [https://www.dol.gov/sites/dolgov/files/ETA/naws/pdfs/NAWS\\_6\\_Regions\\_Map.pdf](https://www.dol.gov/sites/dolgov/files/ETA/naws/pdfs/NAWS_6_Regions_Map.pdf)

First, I identified the individuals in the sample whose primary task was harvesting crops during the time they were surveyed using the NAWS variable TASK. Then, I classified harvest workers into two groups using the NAWS variable D11: (i) those who were paid a piece rate and (ii) those who were paid an hourly wage rate. For the harvest workers who were paid a piece rate, I identified those who were being compensated directly as an individual, as opposed to as a crew (variable D13), so that the reported earnings could be directly assigned to that employee (as opposed to an average for a whole crew). Then, I identified the hourly earnings of all harvest workers using the variable WAGET1. The variable WAGET1 is created by the NAWS survey statisticians and identifies the hourly earnings of all workers for their current harvest activities. For the individuals

<sup>3</sup> The Department of Labor recommends using more than one year of data to construct robust statistics, and they recommend constructing weighted averages by applying the probability sample weighting variable PWTYCRD. I followed these recommendations in my analysis. Specifically, their instructions state “The NAWS uses a complex sampling design that includes both stratification and clustering; for this reason, users must make use of sampling weights to adjust the relative value of each farmworker so that population estimates may be obtained from the sample. The NAWS sampling weight variable PWTYCRD includes a factor which correctly proportions the data for analysis. The PWTYCRD variable is used for almost all NAWS analysis and allows merging several years of data together. At least two consecutive years of data should be combined” (DOL, 2018).

who are paid piece rates, the WAGET1 variable is calculated as follows:

$$\frac{D18 \times D16}{D17},$$

where *D18* identifies how much the worker is paid for each “piece” (i.e., box, bin, bucket, etc.), *D16* identifies how many of these “pieces” they picked, and *D17* identifies the number of hours they worked. For individuals who are paid an hourly wage rate, WAGET1 identifies that hourly wage rate.

Next, I extracted the Adverse Effect Wage Rate (AEWR) data for the Pacific, Mountain I, Mountain II, and California Farm Labor Survey (FLS) regions from the USDA National Agricultural Statistics Service’s Quickstats system (see Figure 2). As can be seen in Figure 1, the states contained in the Northwest NAWS region include Colorado (CO), Idaho (ID), Oregon (OR), Montana (MT), Nevada (NV), Utah (UT), Washington (WA), and Wyoming (WY), but the public access NAWS does not assign workers to a particular state in this region. Figure 2 shows that these Northwest NAWS states cover three FLS regions (i.e., Pacific, Mountain I, and Mountain II). I identified the highest AEWR in these three FLS regions in each year and merged that value into the Northwest region NAWS data. The earnings of employees in the Northwest NAWS region were compared to that maximum AEWR value.<sup>4</sup> The California hourly earnings values are compared to the California AEWRs.

**Figure 2:** USDA Farm Labor Survey Region Map



Source: <https://downloads.usda.library.cornell.edu/usda-esmis/files/x920fw89s/pv63h9083/gq67m157z/fmla1122.pdf>

<sup>4</sup> In every year of the sample, the Pacific FLS region (i.e., Oregon and Washington) had the highest AEWR among the Pacific, Mountain I, and Mountain II FLS regions.

For the Northwest NAWS region, I created a binary indicator variable that assigned individuals in that region a value of 100 if they had hourly earnings in a given fiscal year (e.g., fiscal year 2016) that was above the maximum AEW in the Pacific, Mountain I, and Mountain II FLS regions for the corresponding calendar year (i.e., calendar year 2016) and zero otherwise.<sup>5</sup> For California, I created a binary indicator variable that assigned individuals in the California NAWS region a value of 100 if they generated hourly earnings in a given fiscal year (e.g., fiscal year 2016) that was above the California AEW for the corresponding calendar year (i.e., calendar year 2016) and zero otherwise. I calculated weighted averages of these binary indicator variables using the NAWS weighting variable PWTYCRD. These weighted averages provide estimates of the percentage of employees who had hourly earnings that were greater than the AEW.

To determine whether piece rate harvest workers had hourly earnings that were higher than harvest workers who were paid on an hourly basis, I calculated weighted averages of the hourly earnings for each group of harvest workers separately for the period covering fiscal years 2011 to 2020 and, for comparison, fiscal years 2016 to 2020. NAWS earnings values were converted to real (i.e., inflation adjusted) 2020 dollar values using the Consumer Price Index (CPI) found at <https://www.bls.gov/cpi/data.htm>. I used the annual CPI values for the current, not seasonally adjusted, US city average for all items. The NAWS samples are collected on a fiscal year basis (i.e., October 1 to September 30), and 25% of the time in a given fiscal year is contained in the previous calendar year and 75% of the time in the current calendar year, so I created a weighted average using CPI data from both years. For example, the earnings values for fiscal year 2016 are converted to 2020 dollar values by using the following formula:

$$Real\ Earnings_{2020} = Earnings_{FY2016} \times \left[ .25 \times \frac{CPI_{2020}}{CPI_{2015}} + .75 \times \frac{CPI_{2020}}{CPI_{2016}} \right],$$

where  $Real\ Earnings_{2020}$  is the inflation adjusted 2020 earnings value,  $Earnings_{FY2016}$  is the earnings value reported in the fiscal year 2016 NAWS data, and  $CPI_j$  denotes the CPI value from calendar year  $j$ . I calculated the average of these real earnings values for each group of harvest workers by applying the NAWS weighting variable PWTYCRD.

## Results

### *Northwest NAWS Region*

The results indicate that *at least* 70% of the Northwest NAWS region harvest workers working for piece rates had hourly earnings greater than the AEW during fiscal years 2011 through 2020 (see

<sup>5</sup> My calculation of the percentage of piece rate harvest workers who earned hourly compensation that exceeded the AEW in the Northwest NAWS region is conservative (i.e., the true percentage is likely higher) because some employees in the sample may have been located in a state where the AEW was lower than the maximum AEW in the three FLS regions that span the NAWS Northwest region. Moreover, the public access NAWS only identifies the fiscal year October 1 – September 30, so, to the extent that there is earnings growth in the farm labor market over time, my estimates of the percentage of piece rate harvest workers who earned hourly compensation that exceeded the AEW in a given year is conservative (i.e., the true percentage is likely higher) because the earnings of individuals surveyed between October 1 and December 31 of a given calendar year (which falls in the following fiscal year) are compared to the AEW for the following calendar year.

top panel of Table 1). This 70% is a lower bound because the hourly earnings measures were compared to the maximum AEWL across the three FLS regions that cover the Northwest NAWL region. Thus, the true percentage is likely higher than 70%.

Northwest region piece rate harvest workers earned an average of \$5.13 (in \$2020) more per hour (41% more) than Northwest harvest workers who were paid on an hourly basis between fiscal years 2011 and 2020. Harvest workers in this region who worked for hourly wages earned an average of \$12.47 per hour (in \$2020) between fiscal years 2011 and 2020, while piece rate workers earned an average of \$17.61 per hour (in \$2020). Results from the smaller but more recent sample covering fiscal years 2016 – 2020 are similar (see bottom panel of Table 1), which shows that 69% of piece rate harvest workers had hourly earnings above the AEWL. Between fiscal years 2016 and 2020, Northwest piece rate harvest workers earned an average of \$17.19 per hour, while hourly wage harvest workers earned \$13.83 (a difference of \$3.37 or 24%).

**Table 1: Percentage of Northwest Harvest Employees Paid Above the AEWL and Average Hourly Earnings by Compensation Type Between FY2011 – FY2020**

Type of Harvest Employee	% of Employees Earning Above the AEWL	Standard Error	Average Hourly Earnings (in \$2020)	Standard Error	Number of Observations
<b>Northwest NAWL Region (FY2011 - FY2020)</b>					
Paid by Piece Rate	70.13%	6.54%	\$17.61	\$0.58	153
Paid by Hourly Wage	15.51%	2.90%	\$12.47	\$0.32	338
Difference b/w Piece Rate and Hourly Workers	54.62%		\$5.13		
<b>Northwest NAWL Region (FY2016 - FY2020)</b>					
Paid by Piece Rate	69.44%	8.70%	\$17.19	\$0.70	71
Paid by Hourly Wage	22.59%	4.87%	\$13.83	\$0.54	154
Difference b/w Piece Rate and Hourly Workers	46.86%		\$3.37		

### ***California NAWL Region***

I replicated this analysis for the state of California and found that 61% of piece rate harvest workers had hourly earnings above the AEWL between fiscal years 2011 and 2020 (see top panel of Table 2). Over this period of time, piece rate harvest workers in California earned an average of 24% more per hour (\$2.81 in \$2020) than harvest workers who were paid an hourly wage rate.

**Table 2: Percentage of California Harvest Employees Paid Above the AEWL and Average Hourly Earnings by Compensation Type Between FY2011 – FY2020**

Type of Harvest Employee	% of Employees Earning Above the AEWL	Standard Error	Average Hourly Earnings (in \$2020)	Standard Error	Number of Observations
<b>California NAWL Region (FY2011 - FY2016)</b>					
Paid by Piece Rate	60.84%	4.35%	\$14.35	\$0.40	274
Paid by Hourly Wage	16.17%	2.55%	\$11.54	\$0.15	911
Difference b/w Piece Rate and Hourly Workers	44.67%		\$2.81		
<b>California NAWL Region (FY2016 - FY2020)</b>					
Paid by Piece Rate	77.27%	5.13%	\$16.68	\$0.54	120
Paid by Hourly Wage	23.41%	3.92%	\$12.48	\$0.19	465
Difference b/w Piece Rate and Hourly Workers	53.86%		\$4.20		

In the more recent sample that covers fiscal years 2016 through 2020 (see bottom panel of Table 2), 77% of piece rate harvest workers in California had hourly earnings that exceeded the AEWL.



Between fiscal years 2016 and 2020, California piece rate harvest workers earned an average of \$16.68 (in \$2020), and California harvest workers working for hourly wages earned an average of \$12.48. Thus, California piece rate harvest workers earned an average of \$4.20 more per hour (34% more) than harvest workers who were paid on an hourly basis between fiscal years 2016 and 2020.

### **Conclusion**

Using a statistically representative sample of harvest workers in the Northwest NAWS region that includes the state of Washington, at least 70% of harvest workers who were working for piece rates during fiscal years 2011 through 2020 generated hourly earnings that were higher than the AEWR. In the Northwest NAWS region, 69% of harvest workers who were working for piece rates during fiscal years 2016 through 2020 generated hourly earnings that were higher than the AEWR. In California, 77% of piece rate harvest workers generated hourly earnings above the AEWR between fiscal years 2016 and 2020. In the Northwest region, harvest workers who worked for piece rates earned an average of 41% more per hour than harvest workers who worked for hourly wages between fiscal years 2011 and 2020 and 24% more between fiscal years 2016 and 2020. In California, harvest workers who worked for piece rates earned an average of 24% more per hour than harvest workers who worked for hourly wages between fiscal years 2011 and 2020 and 34% more between fiscal years 2016 and 2020.

The results of this analysis indicate that piece rate harvest workers in the Northwestern region of the United States typically had hourly earnings that exceeded the applicable AEWR between fiscal years 2011 and 2020. Moreover, piece rate harvest workers had hourly earnings that were significantly higher than harvest workers who were paid an hourly wage rate.

### **References**

DOL (US Department of Labor). 2018. An Introduction to Analyzing the NAWS Public Access Data. Retrieved from:

[https://www.dol.gov/sites/dolgov/files/ETA/naws/pdfs/Intro\\_Analyzing\\_NAWSPAD.pdf](https://www.dol.gov/sites/dolgov/files/ETA/naws/pdfs/Intro_Analyzing_NAWSPAD.pdf).

\_\_\_\_\_. 2023. National Agricultural Workers Survey [dataset]. Retrieved from:

<https://www.dol.gov/agencies/eta/national-agricultural-workers-survey>.

Lazear, Edward P. 2000. Performance Pay and Productivity. *The American Economic Review*, 90(5): 1346-1361. Retrieved from:

<https://www.aeaweb.org/articles?id=10.1257/aer.90.5.1346>.

USDA (United States Department of Agriculture). 2023. Farm Labor Survey [dataset]. Retrieved from: <https://quickstats.nass.usda.gov/>.